Designing Products and Services for the Future: The Library Meets the Machine

CENDI - Rethinking Products and Services in a Digital Infrastructure

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DataConservancy

Data Conservancy

- One of five awards through US National Science Foundation's (NSF) DataNet program
- Culmination of over a decade of experience with Sloan Digital Sky Survey (SDSS) data
- Data Conservancy is a community that develops solutions for data preservation and sharing to promote cross-disciplinary re-use.

Is Data Really Different?

- “Data is the new oil” (stated in Qatar, European Commission, etc.)
- Data is the fourth factor of production (McKinsey)
- Todd Park estimates location sensitive apps generate $90 billion of value annually
- McKinsey estimates potential $3 trillion of economic value across seven sectors within US alone
- White House Office of Science and Technology Policy Executive Memorandum
- White House Open Government Initiative

Implications for Libraries

- Libraries are built on three pillars – collections, services and infrastructure.”
  - Winston Tabb, Sheridan Dean of University Libraries, Johns Hopkins University

- Consider data and libraries from these three pillars

Collections

- Data are a new form of collections – though they are fundamentally different in nature
- Created or converted to digital format for processing by machines
- Entirely new methods are required
- New form of special collections

“Big Data”

- What is Big Data?
- There are definitions based on the “V’s” of Big Data (e.g., volume, velocity, variety)
- What is clear is that it’s different from “spreadsheet science” (or long-tail science)
- For me, if a community’s ability to deal with data is overwhelmed, it’s “Big Data” – it’s more about “M’s” (methods or lack thereof) than “V’s”

Services

- There is a core of services that span across data from different disciplines, contexts, etc. – archiving is a good example
- If data collections are basically open, libraries may need to differentiate themselves by the services they offer
- Combination of machine and human mediated services
- There will be a set of services that only “experts” will be able to offer

Levels of Services and Curation for High Functioning Data

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Introduction

The growing volume and variety of data brings new demands and opportunities. This conceptual model represents levels of data repository services and the cumulative nature of curation.

The Data Management Stack model integrates contributions from two groups within the Data Conservancy Initiative (http://dataconservancy.org):

- The Technical team and Data Management Services team at Johns Hopkins University, focused on designing and implementing systems (Choudhury & Hanisch, 2009; Mayernik et al, 2012)
- The Data Practices team at the University of Illinois, focused on social studies of data curation (Palmer et al., 2011; Weber et al, 2012).

The Model

The model represents four levels of activity and capacity shown in the center panel. It builds on definitions offered by Lord and Macdonald (2004). Today, the use of these terms, together with the notion of data stewardship (NAP, 2009), is fluid and inconsistent. Caution is advised in applying these concepts (BRTF, 2010).

Progress with Shared Vocabulary

The Stack Model has proven useful for communicating with researchers who often use terms such as **storage**, **archiving**, **preservation** and **curation** interchangeably.

The model contributes to building a shared vocabulary by making evident

- connections and dependencies among levels of services
- ramifications of repository choices made by researchers

Data Management Layers

Layers	Characteristics	Implication for PI	Implication relative to NSF
Curation	• Adding value throughout life-cycle	• Feature Extraction • New query capabilities • Cross-disciplinary	• Competitive advantage • New opportunities
Preservation	• Ensuring that data can be fully used and interpreted	• Ability to use own data in the future (e.g. 5 yrs) • Data sharing	• Satisfies NSF needs across directorates
Archiving	• Data protection including fixity, identifiers	• Provides identifiers for sharing, references, etc.	• Could satisfy most NSF requirements

Storage	• Bits on disk, tape, cloud, etc.
	• Backup and restore
		• Responsible for:
		  • Restore
		  • Sharing
		  • Staffing
			• Could be enough for now but not near-term future

The Stack

Increasing layers of support and functionality; each level depends on the level below. (Choudhury, 2009).

- **Storage**: lowest service; basic physical storage with backup and restore services.
- **Archive**: following BRTF, "activities that enable long-term retention of digital materials"; DC focus on data protection through replication, fixity, and identifiers.
- **Preservation**: providing enough representation information, context, metadata, fixity, etc. to support use and interpretation by agents other than the original data producer.
- **Curation**: processes that add value to foster discovery and reuse.

The curation level identifies a range of services, enabling use for purposes not necessarily envisioned by the data producers.

References

BRTF (2010). Blue Ribbon Task Force Report on Sustainable Economics for a Digital Planet: Ensuring Long-Term Access to Digital Information by the Blue Ribbon Task Force on Sustainable Digital Preservation and Access. http://brtf.sdsc.edu/biblio/BRTF_Final_Report.pdf

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Lord, P., A. MacDonald, et al. (2004). From data deluge to data curation. Proceedings of the UK e-Science All Hands Meeting, Nottingham.

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National Science Foundation
DataConservancy

Acknowledgements

Thanks to other contributing team members Barbara Pralle, David Fearon, Betsy Gunia, Ruth Duerr, Tiffany Chao, Nicholas Weber, and Cheryl Thompson. This research was supported by the National Science Foundation DataNet award OCI-0830976 and IMLS award #RE-02-10-0004-10.

Institute of Museum and Library Services
Data Curation Education In Research Centers
DCERC

Understanding Infrastructure: Dynamics, Tensions, and Design

Report of a Workshop on "History & Theory of Infrastructure: Lessons for New Scientific Cyberinfrastructures"

Paul N. Edwards
Steven J. Jackson
Geoffrey C. Bowker
Cory P. Knobel

January 2007

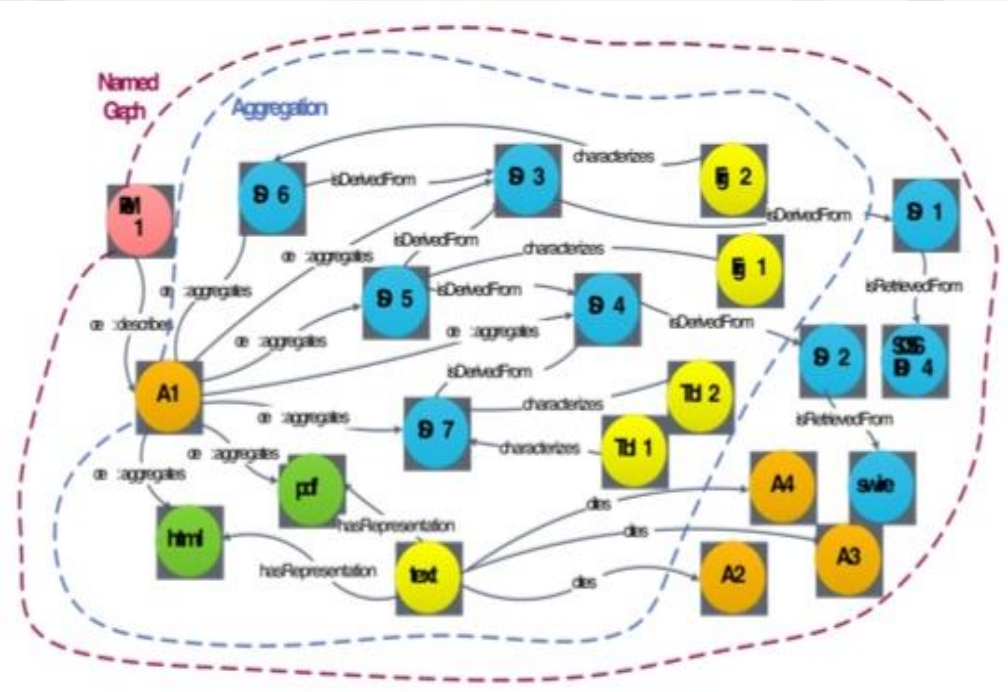
NSF Grant 0630263 • Human and Social Dynamics • Computer and Information Science and Engineering • Office of Cyberinfrastructure

…not a rigid road map but principles of navigation. There is no one way to design cyberinfrastructure, but there are tools we can teach the designers to help them appreciate the true size of the solution space – which is often much larger than they may think, if they are tied into technical fixes for all problems.

Infrastructure

- Data will require fundamentally new systems and infrastructure
- Institutional repositories can be useful gateways but not long-term solutions (particularly for “Big Data”)
- Libraries will need to operate at scale through an integrated, ecosystem approach to infrastructure
- Customized (“human mediated”) services most effective as interpretative layer on machine based services

Building the article graph



- Graph-based view of connections among publications, data, agents, and their properties
- Many-to-many relationships rather than one-to-one view of current systems
- Tracking and preservation of these connections through the scholarly communications cycle

Acknowledgements

- NSF Award OCI-0830976
- Alfred P. Sloan Foundation
- Sheridan Libraries and JHU financial support

- http://dataconservancy.org
- http://dmp.data.jhu.edu -- JHU Data Management Services
- https://www.youtube.com/watch?v=F6iYXNvCRO4 -- data management layer stack model
- RMap Project - http://rmap-project.info/rmap/